

Name: _____

Date: _____

Moles of Iron and Copper

Objectives:

1. To determine the number of moles of copper produced in the reaction of iron and copper II chloride.
2. To determine the number of moles of iron used up in the reaction of iron and copper II chloride.
3. To determine the ratio of moles of iron to moles of copper.
4. To determine the combining capacity of Fe when ionized in this reaction.

Materials:

copper II chloride	1-250mL beakers	wash bottle	stir rod
2-3 iron nails	crucible tongs	water	1 – 400mL beaker
Sandpaper	mass balance	scoopula	paper towel

Procedure:

1. Obtain a clean, dry 250mL beaker.
2. Find the mass of the beaker and record in Table 1
3. Add approximately 8g of copper II chloride to the beaker.
4. Add about 150mL of water to the beaker. Swirl the beaker so that all of the copper II chloride dissolves in the water.
5. Obtain 2-3 clean, dry nails. If the nails are dirty or rusty, use a piece of sandpaper to clean them until the surface is shiny.
6. Find and record the mass of the nails in Table 1.
7. Place the nails head down into the copper II chloride solution. Leave them undisturbed until you notice a buildup on the nails, then carefully shake the beaker to loosen and release the buildup. Repeat multiple times over the next half hour.
8. After approximately 30 minutes, use the tongs to carefully pick up the nails one at a time. Use the scoopula and water from the wash bottle to wash off any buildup from the nail back into the beaker. Make sure all of the buildup falls back into the beaker.
9. Set the nails aside to dry on paper towel.
10. Decant as much of the liquid as possible from the beaker using the 400mL beaker and the stir rod (watch the teacher demonstration). Be careful not to pour out any of the solid.
11. Put your 250mL beaker with copper powder into the drying oven. Place some paper towel underneath it with your initials on it.
12. Once the nails are dry, find the mass and record it in Table 1.
13. NEXT DAY: Find the mass of the 250mL beaker with the copper inside and record in Table 1.
14. Scrape the copper into a waste beaker provided by the teacher.
15. Wash out your beaker and scoopula and return.

Data and Observations:

Table 1 – **compose a title for this table*

Mass of Nails Before Reaction (g)	Mass of Nails After Reaction (g)	Mass of Iron Used (g)	Mass of Beaker (g)	Mass of Beaker & Copper (g)	Mass of Copper Produced (g)

Sample Calculations: **2 in total: Mass of Iron Used and Mass of Copper Produced*

Questions:

1. What *type* of chemical reaction occurred?
2. Write the two *possible* reaction equations for this reaction. *Hint: there are two combining capacities (use the periodic table) for Fe, and we don't know which one occurred.*
3. Determine the number of moles of iron used in your reaction.
4. Using the mass of copper produced in your reaction, determine the moles of copper obtained at the end of the experiment.
5. Using your results from Questions 3 & 4, determine an **experimental** ratio of moles of copper produced to moles of iron produced.
6. Using your ratio from Question 5, predict which reaction from Question 2 is the reaction that occurred in your experiment and explain why.
7. From Question 6, what is the combining capacity of Fe in this reaction?
8. Now that you know what chemical reaction occurred, use the ratio for that equation to calculate the moles of iron that would be needed to produce 45.0g of copper.
9. How many grams of copper would be produced if 456g of iron reacted?
10. How many atoms of iron are needed to produce 12.5g of copper?

Conclusion:

State the results of Objectives 3 and 4.